

What is claimed is:

1. A method for conducting a plurality of assays for a plurality of different analytes in a carrier that may contain said different analytes, comprising:

providing a surface plasmon resonance active surface;

associating a plurality of different extended coupling matrices to said surface;

contacting said surface with said carrier, wherein the presence or absence of a specific analyte results in an increase, a decrease or no change in the indices of refraction of said extended coupling surfaces;

detecting said changes in said indices of refraction by measuring the SPR profile, wherein the SPR profile is distinguishable between said different extended coupling matrices.

2. The method of claim 1 wherein said active surface is a thin metal film.

3. The method of claim 2 wherein said thin metal film is selected from the group consisting of gold, copper, silver, aluminum.

4. The method of claim 1 wherein coupling matrices are covalently bound through sulfur bonds to alkyl chains of length from 2 to

20 carbons.

5. The method of claim 4 wherein coupling matrices comprise of atoms selected from the group consisting of gold, platinum, palladium, silver, aluminum, and copper.

5 6. The method of claim 1 wherein said carrier is air.

7. The method of claim 1 wherein said analytes are selected from the group consisting of chemical agent, biological agent and toxic industrial chemical.

8. An apparatus for sensing the amount, concentration or presence  
10 of a substance through optically monitoring simultaneous increases in refractive index at positive layers, no change in refractive index at nonreactive layers, and decreases in refractive index at negative layers.

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